

First International Conference on Energy and Indoor Environment for Hot Climates

February 24-26, 2014 | Doha, Qatar



PROGRAM BOOK

Monday, February 24

Monday, February 24, 10:00 AM-11:00 AM

KEYNOTE ADDRESS 1

Integrating Indoor Air Quality and Energy Efficiency in Buildings

by ASHRAE President William P. Bahnfleth, Ph.D., P.E., Fellow ASHRAE, Pennsylvania State University, University Park, PA

Chair: Walid Chakroun, Ph.D., Fellow ASHRAE, Kuwait University, Kuwait, Kuwait

Buildings are one of the largest energy end use sectors in countries around the globe. Concerns for the availability of energy supplies and the impact of energy use on the environment are driving a worldwide focus on energy end use reduction. In this push for dramatic changes in the energy use intensity of the building sector, it is essential that the fundamental importance of indoor environmental quality, particularly indoor air quality, not be lost. This presentation addresses: 1) the significance of indoor air quality in terms of its impact on health and productivity and associated costs; 2) the inseparable linkage between indoor air quality and building energy demands, including examples of efficient technologies for maintaining good indoor air quality; and 3) the need for an approach to building research, design, and operation that recognizes this connection.

Monday, February 24, 11:00 AM-11:30 AM

Developing Economy Countries and ASHRAE: A Collaborative Vision

Chair: Walid Chakroun, Ph.D., Fellow ASHRAE, Kuwait University, Kuwait, Kuwait

This session highlights ASHRAE's efforts to meet the needs of developing economy countries in building for the future. A discussion of needs will be facilitated by ASHRAE President Bill Bahnfleth and Walid Chakroun, conference organizer and member of ASHRAE's Developing Economies Presidential ad hoc Committee.

Monday, February 24, 11:00 AM-12:30 PM

CONFERENCE PAPER SESSION 1

Modeling Building Load

Chair: James Walters, AHRI, Arlington, VA

1. CFD Analysis for Air Conditioning System for Outdoor Environment

Abdelkader Benzamia, M.D.¹, Abdul Afoo Parkar¹ and Salah Nezar, Member², (1)Flowpak w.l.l, Doha,, Qatar, (2)Qatar Project Management, Doha, Qatar

2. Passive Pre-Cooling Potential for Reducing Building Air-Conditioning Loads in Hot Climates

Hassam Nasarullah Chaudhry, Ph.D.¹, Ben Richard Hughes, Ph.D.¹ and Saud Abdul Ghani, Ph.D.², (1)University of Leeds, Leeds, United Kingdom, (2)Qatar University, Doha, Qatar

3. Relevance of Radiant Cooling in Indian Context

Srijan Kumar Didwania, Rajan Rawal and Yash Shukla, CARBSE, CEPT University, Ahmedabad, India

4. Reducing Energy Consumption of Space Conditioning Systems in Hot Climate

Mohamad Kharseh¹, Mohammed Al Khawajah¹ and Ferri Hassani², (1)Mechanical & Industrial Engineering Department, Qatar University, Doha, Qatar, (2)Department of Mining Metals and Materials Engineering, McGill University, Montreal, QC, Canada

5. Indirect Evaporative Precooling of Fresh Air using Heat Exchangers with Enhanced Flow Passages

Milind V. Rane, Ph.D., Member and Shreyas A. Chavan, Indian Institute of Technology Bombay, Mumbai, India

Monday, February 24, 11:30 AM-12:30 PM

Promoting Low GWP Refrigerants for Air-Conditioning Sectors in High-Ambient

Temperature Countries (PRAHA)

Sponsor: UNEP

Chair: Walid Chakroun, Ph.D., Fellow ASHRAE, Kuwait University, Kuwait, Kuwait

The Gulf region is facing multiple challenges of meeting energy efficiency standards and refrigerant transformation requirements with limited research work being in the region. The situation leads the air-conditioning industry in this region of mainly high-ambient temperature countries to uncertainty and vagueness. The challenges are accentuated by unclear global trends about refrigerant alternatives, the unavailability of components and the absence of relevant codes / standards that can facilitate the introduction of low-GWP alternatives and deal with the flammability issue. The PRAHA project, which is supported by the Multilateral Fund of the Montreal Protocol, is an effort to help the industry address these challenges.

1. Challenges when It Comes to High Ambient Temperatures

Walid Chakroun, Ph.D., Fellow ASHRAE, Kuwait University, Kuwait, Kuwait

2. Low-GWP Refrigerants in High Ambient Countries: Challenge or Opportunity?

Bassam Elassaad, Consultant, Brussels, Belgium

Monday, February 24, 1:30 PM-2:30 PM

CONFERENCE PAPER SESSION 2

HVAC System Operation

Chair: Saud Abdul Ghani, Ph.D., Qatar University, Doha, Qatar

1. "Cloud" Service for Computer Simulation of Air-Conditioning and Refrigerating Systems

Valery Ochkov, Dr.Ing.¹, Volodymyr Voloshchuk, Ph.D., Affiliate², Konstantin Orlov, Ph.D.¹ and Alexey Ochkov, P.Eng.¹, (1)Moscow Power Engineering Institute (Technical University), Moscow, Russia, (2)National University of Water Management and Nature Resources Use, Rivne, Ukraine

2. A Simplified Re-Commissioning Approach of Multiple-Chiller Systems of Institutional Building on a Hot Climate

Ali Alajmi, Ph.D., Associate Member and Hosny Abou-Ziyan, Ph.D., College of Technological Studies, Kuwait, Kuwait

Monday, February 24, 1:30 PM-2:30 PM

CONFERENCE PAPER SESSION 3

Sustainable Buildings

Chair: Nesreen Ghaddar, PhD, Member, American University of Beirut, Beirut, Lebanon

1. The Usability of Green Building Rating Systems in Hot Arid Climates

Shady Attia, Ph.D., Member, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

2. Strategic Decision Making For Zero Energy Buildings in Jordan

Shady Attia, Ph.D., Member, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

3. The Impact of Urban Form on Buildings' Energy Performance in Hot-Arid Climates

Mohammed A. Bakarman, The University of Kansas, Lawrence, KS

4. Design Optimization of Energy Efficient Residential Buildings in MENA Region

Moncef Krarti, Ph.D., P.E., Member, University of Colorado, Boulder, CO

Monday, February 24, 3:15 PM-4:15 PM

KEYNOTE ADDRESS 2

Traditional Technologies for Modern Problems: Re-energizing Wind Towers

by Ben Richard Hughes, Ph.D., University of Leeds, Leeds, United Kingdom

Chair: Hassan Sultan, MZ&Partners, Doha, Qatar

Modern society demands ever-increasing levels of thermal comfort. The advancement of heating, ventilation and air-conditioning (HVAC) technologies as affordable solutions has further enhanced user expectations of indoor air temperature. HVAC now accounts for 40-60% of energy consumption in the built environment. Climate change and government policy has increased the demands made on engineers to reduce energy consumption whilst meeting user demands for thermal comfort. Therefore a low energy device that meets thermal comfort requirements is highly desirable. One such device is a wind tower, which uses natural resources to both ventilate and regulate indoor air temperatures. This technology is not new; in fact it has been in existence for over a thousand years throughout the Middle East. Using modern sophisticated techniques it has been possible to re-examine these device and make them fit for purpose for modern day requirements. This talk will focus on the development of modern day commercial wind towers, with particular focus on the latest development of a wind tower capable of supplying 15 degrees cooling without any energy consumption. A study developed as a collaboration between the University of Leeds and Qatar University funded by the Qatar National Research Fund 3rd Cycle.

EVENING EVENT

Dinner in Katara, the Cultural Village. *Sponsored by QEERI.*

Tuesday, February 25

Tuesday, February 25, 8:00 AM-10:00 AM

HVAC&R Technologies

Sponsor: AHRI and ASHRAE Qatar Oryx Chapter

Chair: Bassam Elassaad, Consultant, Brussels, Belgium

Designing, manufacturing, and installing HVAC&R systems for optimal operation in hot climates has always been a challenge. Today that is even more the case. New equipment must meet rising minimum efficiency performance standards (MEPS) and be designed to operate with a variety of alternative refrigerants that can be very equipment specific. This session includes an update on the search for alternative refrigerants that meet the complex criteria set by the international protocols and the local standards and regulation, and a paper on efficiency standards in Europe explaining the Eco Design directive with an introduction to seasonal energy efficiency. Moving to other aspects of system design, the other papers will discuss the system effect in designing ventilation equipment to explain why fans perform differently in a system than when tested in a lab; and another paper on the role of temperature and ventilation rates in hot climates.

1. Novel Non-Flammable Refrigerant Composition for Air Conditioning in Hot Climate Conditions

Thomas J. Leck, Ph.D., Member, DuPont de Nemours and Company, Wilmington, DE

2. Ecodesign and Seasonal Energy Efficiency in Europe and Opportunity for Energy Savings in Hot Climates

Veerle Beelaerts, Ph.D., Environment Research Center, Daikin Europe, Oostende, Belgium

3. Role of Temperature and Ventilation Rates in Hot Dry Climates

Riham M. Jaber Ahmed, Ph.D. Candidate, UCL, London, United Kingdom

4. System Effects in the Designing of Ventilation

Tanmoy Choudhury, MAICO Gulf LLC, Ras Al Khaimah, United Arab Emirates

5. Passive Desiccant Dehumidification Technology and Dedicated Outdoor Air System Configurations for Hot and Humid Climates

Varun Pahwa, Associate Member, Dessicant Rotors International, Gurgaon, India

6. How to Save Energy in HVAC Equipment: Thermal Break and Energy Savings Method in HVAC

Samir Hamed, PETRA Engineering Industries Co., Amman, Jordan

Tuesday, February 25, 8:00 AM-10:00 AM

World Health Organization Keynote Session

Chair: Carlos Dora, WHO, Amman, Jordan

The session aims at reviewing the current knowledge/state of evidence about energy, indoor environment and health in homes and health care facilities, with views to identifying opportunities for action (including by engineers and those engaged in the building sector as well as by health authorities) and existing knowledge gaps and need for research (in particular regarding energy and indoor environment and health issues in hot climates). It will summarize opportunities for action on the basis of existing knowledge as well as knowledge gaps, and, in the areas above, cover basically: Indoor air quality and health, including WHO guidelines on air quality; Home indoor environment, energy use and health; and Health care facilities, energy access, efficiency and use of renewables.

1. Indoor Air Quality and Health

Mazen Malkawi, WHO, Amman, Jordan

2. Home Indoor Environment, Energy Use and Health

Nathalie Röbbel, WHO, Amman, Jordan

3. Health Care Facilities, Energy Access, Efficiency and Use of Renewables

Carlos Dora, WHO, Amman, Jordan

4. Conclusions and Regional Strategy on Air Quality and Health

A. Basel Al-Yousfi, WHO, Amman, Jordan

Tuesday, February 25, 10:15 AM-11:15 AM

KEYNOTE ADDRESS 3

Solar Cooling in Hot Climates

by Stephen White, Ph.D., CSIRO Energy Technology, Newcastle, Australia

Chair: Hani Hawamdeh, Arab Engineering Bureau, Doha, Qatar

Solar cooling is well suited for taking advantage of excess solar heat during hot summer months. Attractive hot climate technology solutions and applications will be discussed. Success in hot climates should look to take advantage of the potential to reduce peak demand on electricity system infrastructure. The value proposition for electricity utilities will be examined.

Tuesday, February 25, 11:15 AM-12:30 PM

CONFERENCE PAPER SESSION 4

Thermal Comfort

Chair: Samer Fikri, Qatar University, Doha, Qatar

1. Operation Guidelines for Under Floor Air Distribution Systems with Respect to Occupants' Thermal Comfort: A Case Study

Faisal Azzam Baddar¹, Raed Bourisli, Ph.D.² and Ali Alajmi, Ph.D., Associate Member³, (1)Kharafi National KSC, Kuwait, Kuwait, (2)Kuwait University, Kuwait, Kuwait, (3)College of Technological Studies, Kuwait, Kuwait

2. Investigating the Impact of Different Thermal Comfort Models for Zero Energy Buildings in Hot Climates

Shady Attia, Ph.D., Member, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

3. Understanding the Relationship of Radiant Cooling and Natural Ventilation for Commercial Buildings in Mexican Hot Climates

Gilberto Osornio Nieto Sr., Ph.D., Student Member¹, Matthew Herman Sr., P.E., Member¹ and Manuel Falcon Sr., Ph.D.², (1)Illinois Institute of Technology, Chicago, IL, (2)Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico, Mexico

Tuesday, February 25, 11:15 AM-12:30 PM

CONFERENCE PAPER SESSION 5

Renewable Energy Technologies

Chair: Ben Richard Hughes, Ph.D., University of Leeds, Leeds, United Kingdom

1. A Novel Solar Desiccant Cooling System with Low Grade Heat Source for GCC Countries

Esam Elsarrag, Ph.D., Member and Yousef Alhorr, Ph.D., Member, Gulf Organisation for Research & Development, Doha, Qatar

2. Experiences in the Energetic and Environmental Design of HVAC-Systems for a Cultural Building in Qatar

Jürgen B. Masuch, Dr.Ing., Member, Scholze Ingenieurgesellschaft mbH, Leinfelden-Echterdingen, Germany

3. The Application of Low Energy Technology within the Built Environment in Hot and Humid Climates

John Kaiser S. Calautit¹, Ben Hughes, Ph.D.¹ and Saud Abdul Ghani, Ph.D.², (1)University of Leeds, Leeds, United Kingdom, (2)Qatar University, Doha, Qatar

Tuesday, February 25, 1:30 PM-2:30 PM

CONFERENCE PAPER SESSION 6

Systems for Improving IEQ I

Chair: Stephen White, Ph.D., CSIRO Energy Technology, Newcastle, Australia

1. Displacement Air Diffusion for Large Spaces. Madrid-Barajas Airport New Terminal Case Study

Tomas Gil-Lopez, Ph.D., P.E., Affiliate, Miguel A. Galvez-Huerta, Ph.D., Associate Member, Juan Castejon-Navas and Virginia Gomez-Garcia, Madrid Polytechnic University, Madrid, Spain

2. Significance of Demand Control Ventilation in Hot and Humid Climates

Mir Gayas Ali, Member, SSH International Consultants, Kuwait, Kuwait

3. Upper Room UV-Disinfected Mixed Air Use for Chilled Ceiling Displacement Ventilation System to Enhance Air Quality and Performance

Mohamad Kanaan¹, Nesreen Ghaddar, PhD, Member¹, Kamel Abou Ghali, PhD, Member¹, George Araj, M.D.¹, Walid M. Chakroun, Ph.D., P.E., Fellow ASHRAE² and Mohamad Darwish, Ph.D.³, (1)American University of Beirut, Beirut, Lebanon, (2)Kuwait University, Kuwait, Kuwait, (3)Qatar Environment and Energy Research Institute, Doha, Qatar

Tuesday, February 25, 1:30 PM-2:30 PM

CONFERENCE PAPER SESSION 7

Building Envelopes I

Chair: Hani Hawamdeh, Arab Engineering Bureau, Doha, Qatar

1. Active Double and Triple Glazing Thermal Shield In Facades

Jose Miguel Diaz, Dr.Ing., Life Member¹, Fernando Del Ama, Ph.D.² and Juan Antonio Hernandez, Dr.Ing.³, (1)Universidad Politecnica de Madrid, Madrid, Spain, (2)Universidad San Pablo CEU, Madrid, Spain, (3)Universidad Politecnica de Madrid, Madrid, Spain

2. Building Envelope Criteria for Hot Climates: ASHRAE/IES Standard 90.1-2013

John Hogan, P.E., Member¹ and Karim Amrane, Ph.D., Member², (1)Consultant, Seattle, WA, (2)AHRI, Arlington, VA

3. Heat Gain through Window with a Completely Closed Shutter Used in Residential Buildings

Esam Alawadhi, Ph.D., Kuwait University, Safat, Kuwait

Tuesday, February 25, 2:45 PM-3:45 PM

KEYNOTE ADDRESS 4

AHRI Keynote Presentation

by David Calabrese, AHRI Senior Vice President (Policy) and General Counsel

Chair: Saud Abdul Ghani, Ph.D., Qatar University, Doha, Qatar

EVENING EVENT

Dinner in Souq Waqef, the old downtown. *Sponsored by Qatar University.*

Wednesday, February 26

Wednesday, February 26, 9:00 AM-10:00 AM

CONFERENCE PAPER SESSION 8

Systems for Improving IEQ II

Chair: Karim Amrane, Ph.D., Member, AHRI, Arlington, VA

1. Improving Indoor Air Quality by Total Heat Exchanger for an Office Building in Hot and Humid Climate
Fu-Jen Wang, Ph.D., P.E., Member, National Chin-Yi University of Technology, Taichung, Taiwan

2. Field Survey of Air Conditioner Temperature Settings in a Hot, Dry Climates, - Questionnaire Results On Use of Air Conditioners in Houses During Sleep -

Shuichi Hokoi, Ph.D.¹, Noor Hanita Abdul Majid, Ph.D.², Nozomi Takagi, M.D.³, Sri Nastiti N. Ekasiwi, Ph.D.⁴ and Tomoko Uno, Ph.D.⁵, (1)Kyoto University, Kyoto, Japan, (2)International Isulamic University, Malaysia, Kuala Lumpur, Malaysia, (3)Obayashi Corporation, Tokyo, Japan, (4)Institute Technology SEPULUH NOPEMBER, Indonesia, Surabaya, Indonesia, (5)Mukogawa Women's University, Japan, Nishinomiya, Japan

3. DOAS with Evaporative Precooling of Exhaust Air using Rotating Contacting Device

Milind V. Rane, Ph.D., Member and Shreyas A. Chavan, Indian Institute of Technology Bombay, Mumbai, India

Wednesday, February 26, 9:00 AM-10:00 AM

CONFERENCE PAPER SESSION 9

HVAC System Performance

Chair: Mohamed Hamed, Qatar University, Doha, Qatar

1. Energy Saving Potential of Indirect Evaporative Cooling as Fresh Air Pre-cooling in Different Climatic Conditions in Saudi Arabia

Ayman Youssef, P.E., Member and Adel Hamid, Member, Saudi Aramco, Dhahran, Saudi Arabia

2. Enhanced Cooling Coils for Energy Efficient Treatment of Outside Air in Hot and Humid Climates

Richard I. Meskimmon, P.Eng., S & P Coil Products Ltd., Leicester, United Kingdom

3. Multi Utility Evaporative Cooler with Diabatic Contacting Device

Milind V. Rane, Ph.D., Member and Narendra Singh, Indian Institute of Technology Bombay, Mumbai, India

Wednesday, February 26, 10:00 AM-11:00 AM

CONFERENCE PAPER SESSION 10

Building Envelopes II

Chair: Esam Alawadhi, Ph.D., Kuwait University, Safat, Kuwait

1. Heat Transfer Analysis for a Highly Reflective Roof Surface

Hashem Alqallaf, P.Eng. and Esam Alawadhi, Ph.D., Kuwait University, Safat, Kuwait

2. Investigation of the Impact of Temperature on Building Insulation Materials

Maatouk Khoukhi, Dr.Eng., Member, Sultan Qaboos University (SQU), Muscat, Oman

3. Desert Architectural Review of Ghadames Housing in Libya

Jamal M. Alabid, Ahmad Taki, Ph.D., Member and Ben Cowd, Leicester School of Architecture, De Montfort University Leicester, United Kingdom

Wednesday, February 26, 10:00 AM-11:00 AM

CONFERENCE PAPER SESSION 11

Unique Applications

Chair: Mohammed H. Hosni, Ph.D., Fellow ASHRAE, Kansas State University, Manhattan, KS

1. The Impact of Tuneable U-Value on Energy Efficiency and Carbon Emissions of an Eco-Villa in the Gulf Region

Esam Elsarrag, Ph.D., Member and Yousef Alhorr, Ph.D., Member, Gulf Organisation for Research & Development, Doha, Qatar

2. Assessing the Thermal Performance of Bedouin Tents in Hot Climates

Shady Attia, Ph.D., Member, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

3. Cost-Benefit Performance of Photovoltaics and Battery Storage Systems to Secure Load Leveling and Peak Shaving in City Block

Taira Ozaki, Tohru Morioka and Keisuke Noda, Kansai University, Suita, Japan

Wednesday, February 26, 11:15 AM-12:00 PM

CONFERENCE PAPER SESSION 12

Refrigerant Performance

Chair: Bassam Elassaad, Consultant, Brussels, Belgium

1. Performance of Low-GWP Refrigerant Candidates at High Ambient Temperatures

Karim Amrane, Ph.D., Member and Xudong Wang, Ph.D., Member, Air-Conditioning, Heating and Refrigeration Institute (AHRI), Arlington, VA

2. The Effect of High Ambient Temperature on the Performance of an R410a Air Conditioner

Peng Yin, Student Member, Michael Pate, Ph.D., P.E., Member, James F. Sweeney and Josh Kading, Texas A&M University, College Station, TX

Wednesday, February 26, 11:15 AM-12:00 PM

CONFERENCE PAPER SESSION 13

Healthy Indoor Environments

Chair: Mohamed Elghawaja, Qatar University, Doha, Qatar

1. Air Cleaner to Make Up Air in Adverse Thermal and Environmental Conditions

Domenico Capulli, Dr.Eng., Member and Natalia de Mattos Oliveira, P.Eng., Capmetal Environmental Technology, Rio de Janeiro, Brazil

2. Deposition of Dispersed Airborne Particles on Surface in an Indoor Environment

Mohammed H. Hosni, Ph.D., Fellow ASHRAE, Byron Jones and Robert Powell, Kansas State University, Manhattan, KS

Wednesday, February 26, 12:00 PM-1:00 PM

CIBSE KEYNOTE ADDRESS 5

The Role of Thermal Storage in Low Energy Buildings for Hot Climates

by Andy Ford, PPCIBSE, South Bank University, London, United Kingdom

Chair: Walid Chakroun, Ph.D., Fellow ASHRAE, Kuwait University, Kuwait, Kuwait

Hot climate architecture has traditionally utilised seasonal fluctuations and diurnal fluctuations in temperature to create comfort. This has been achieved through the use of thermal mass both in the building fabric and the ground. I will review how modern approaches to low energy design based on these traditional solutions can deliver high levels of comfort.

Wednesday, February 26, 1:00 PM-1:30 PM

Closing Ceremony

Chair: Hassan Sultan, MZ&Partners, Doha, Qatar

Closing remarks and ceremony.

Organized by:



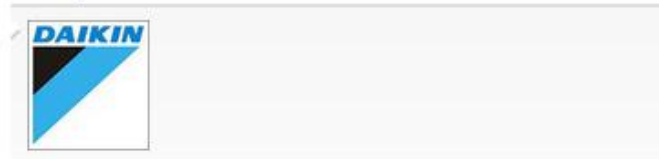
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